

Questions and Answers About Radon and Cancer

1. What is radon?

Radon is a radioactive gas released from the decay of uranium in rocks and soil. It is an invisible, odorless, and tasteless gas that seeps up through the ground and diffuses into the air. In a few areas, depending on local geology, radon dissolves at high concentrations in ground water where it can then be released into the air when water is used. Out of doors, radon gas exists at harmless levels. However, in areas without adequate ventilation, such as underground mines, radon can accumulate to levels that substantially increase the risk of lung cancer.

2. How does radon cause cancer?

Radon quickly decays, emitting tiny radioactive particles. When inhaled, these radioactive particles can damage the cells lining the lung. Long-term exposure to radon can lead to lung cancer, the only cancer proven to be associated with inhaling radon.

3. How is the general population exposed to radon?

Everyone breathes in radon every day, but mostly at very low levels resulting in little adverse effect. However, people who inhale high levels of radon gas may be at an increased risk for developing lung cancer.

Radon enters homes through cracks and holes in the foundation, and can even be released from running water—though radon from water makes a substantial contribution to total indoor radon levels in only few areas of the country. Radon levels measure the highest in homes that are well insulated, tightly sealed, and/or built on uranium-rich soil. Because of their closeness to the ground, basement and first floors typically have the highest radon levels.

4. How many people get lung cancer because of exposure to radon?

Cigarette smoking, the major cause of lung cancer, is responsible for 85 percent of the 170,000 cases diagnosed each year. Radon represents a far smaller risk for lung cancer and is estimated to be responsible for roughly 10 percent, or 17,000 cases per year. This

estimate may be as low as 6,000 to as many as 36,000 radon-associated lung cancers per year. Although the association between radon exposure and smoking is not well understood, exposure to the combination of radon gas and cigarette smoke creates a greater risk for lung cancer than either alone. The majority of radon-related cancer deaths occur among smokers.

5. How was radon discovered to play a role in the development of cancer?

Radon was identified as a health problem when scientists noted that underground uranium miners who were exposed to it died of lung cancer at rates far above what was expected. Most of what is known about radon's cancer-causing potential comes from the study of these miners. Results of miner studies are confirmed by experimental animal studies, which show higher rates of lung tumors among rodents exposed to high radon levels.

6. Will we ever know the actual risk of developing cancer from exposure to indoor radon?

Because most people are not exposed to high levels of radon, and because mobility of the U.S. population prevents the accurate estimation of radon exposure to individuals, it is difficult to identify and study those who are at risk.

However, a new report by National Cancer Institute (NCI) scientists published in the *Journal of the National Cancer Institute* directly examines the effects of residential radon levels on lung cancer risks by using data from eight case-control studies in Canada, China, Finland, Sweden, and the United States. These studies included 4,263 lung cancer patients and 6,612 persons without lung cancer who served as controls. The purpose of this study was to evaluate the inconsistencies in previous studies and to estimate an overall effect of residential radon. The results of this study show a slightly increased risk of lung cancer from household radon. This increased risk is consistent with the level of risk that has been estimated based on studies of underground miners exposed to radon.

NCI scientists estimate that the risk of developing lung cancer increased 14 percent for a person living 30 years in a house with a radon level of 150 Becquerels per cubic meter (Bq/m³), which is approximately equal to 4 picocuries per liter, the level at which the U.S. Environmental Protection Agency (EPA) recommends taking action to reduce radon in a house. About 6 percent of U. S. homes have radon levels at or above 150Bq/m³.

Other studies of household radon are in progress, and efforts are under way to pool the data from completed and ongoing studies. It will be several years before the results of these studies are available.

For homes with very high radon levels there is no question that corrective action is needed. Scientists estimate that lung cancer deaths could be reduced by 2 to 4 percent, about 5,000 deaths, by lowering radon levels in homes where radon levels exceed the EPA's recommended action level.

7. **Should I have my house tested for radon?**

Testing is the only way to know if your home has elevated radon levels. Indoor radon levels are affected by the soil composition under and around the house, and the ease with which radon enters the house. Homes that are next door to each other can have different indoor radon levels, making a neighbor's test result a poor predictor of radon risk in your home. In addition, precipitation, barometric pressure, and other influences can cause radon levels to vary from month to month or day to day, which is why both short- and long-term tests are available. Because radon levels can vary from day to day and month to month, a long-term test is a better indicator of average radon level.

Short-term tests track radon levels for up to 7 days. Long-term detectors give the average concentration for periods of 90 days or more. Both tests are relatively easy to use and inexpensive (\$10 to \$30).

Once a radon problem is corrected, the hazard is gone for good. Costs for reducing radon levels typically range from \$500 to \$2,500, with an average cost of \$1,200. A state or local radon official can explain the differences between testing devices and recommend the most appropriate test for your needs and conditions. The EPA has a list of types of radon detectors meeting their standards.

Several other publications on this subject are available from the EPA. You can obtain them by calling the National Safety Council's radon hotline at 1-800-SOS-RADON (1-800-767-7236).

References

Lubin, J, Boice Jr, J Lung cancer risk from residential radon: Meta-analysis of eight epidemiologic studies. *J Natl Cancer Inst* 1997;89:49-57.

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Sources of National Cancer Institute Information

Cancer Information Service

Toll-free: 1-800-4-CANCER (1-800-422-6237)

TTY (for deaf and hard of hearing callers): 1-800-332-8615

NCI Online

Internet

Use <http://www.cancer.gov> to reach NCI's Web site.

CancerMail Service

To obtain a contents list, send e-mail to cancermail@icicc.nci.nih.gov with the word “help” in the body of the message.

CancerFax® fax on demand service

Dial 301–402–5874 and listen to recorded instructions.

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